

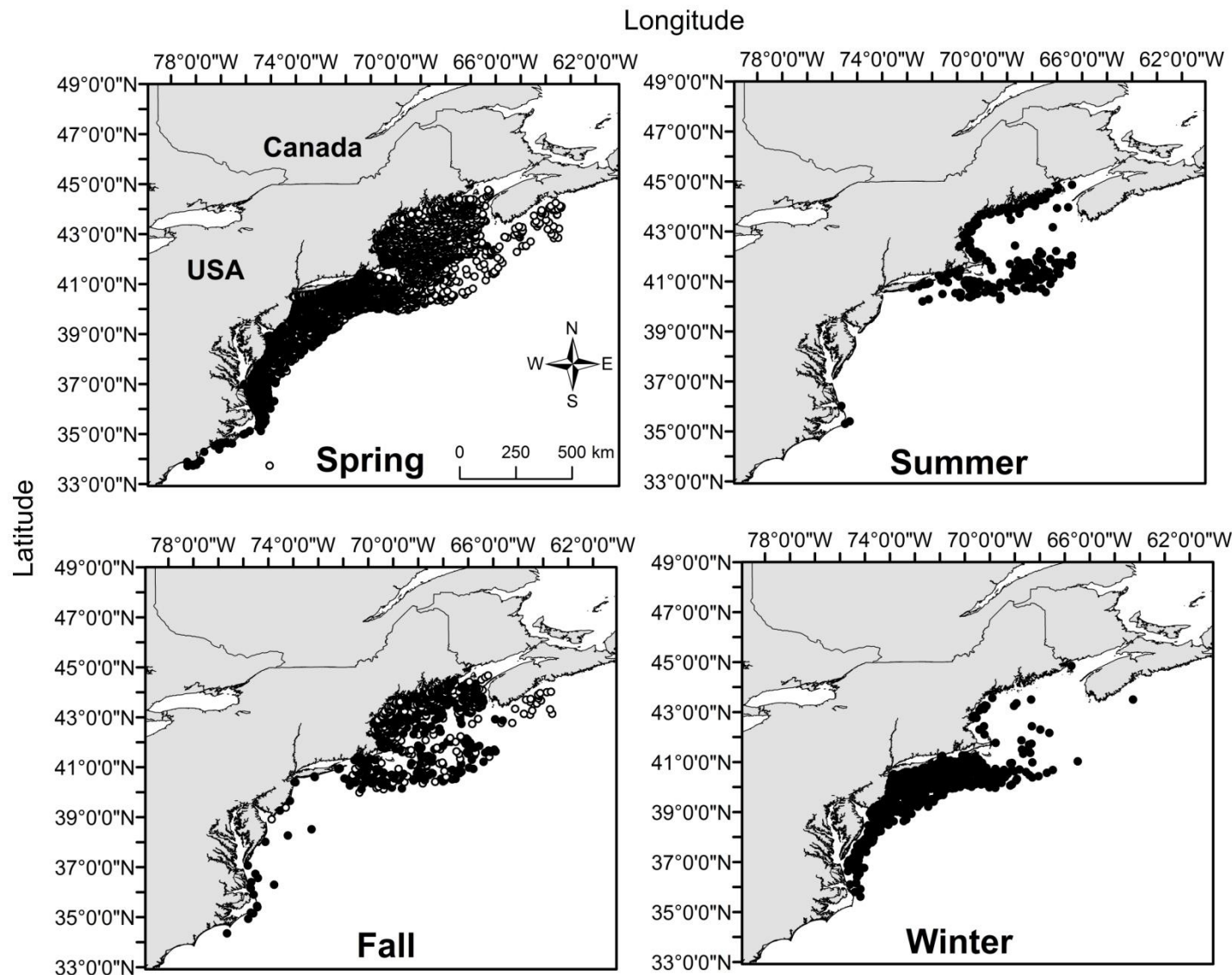
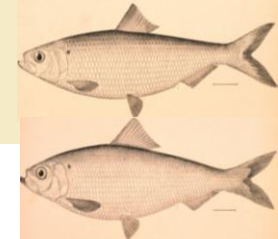
NMFS River Herring Stock structure workshop

Adrian Jordaan, PhD.

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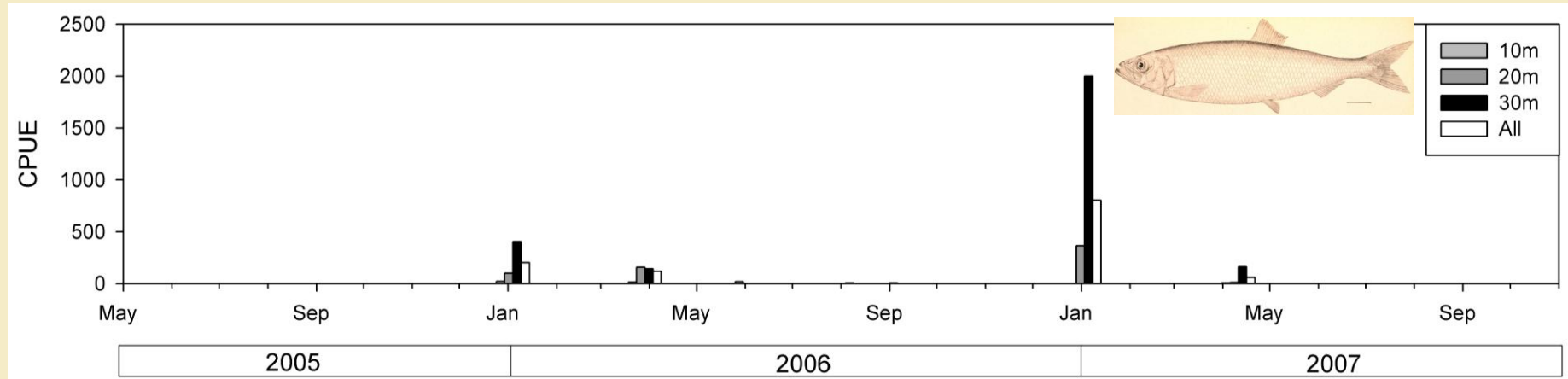
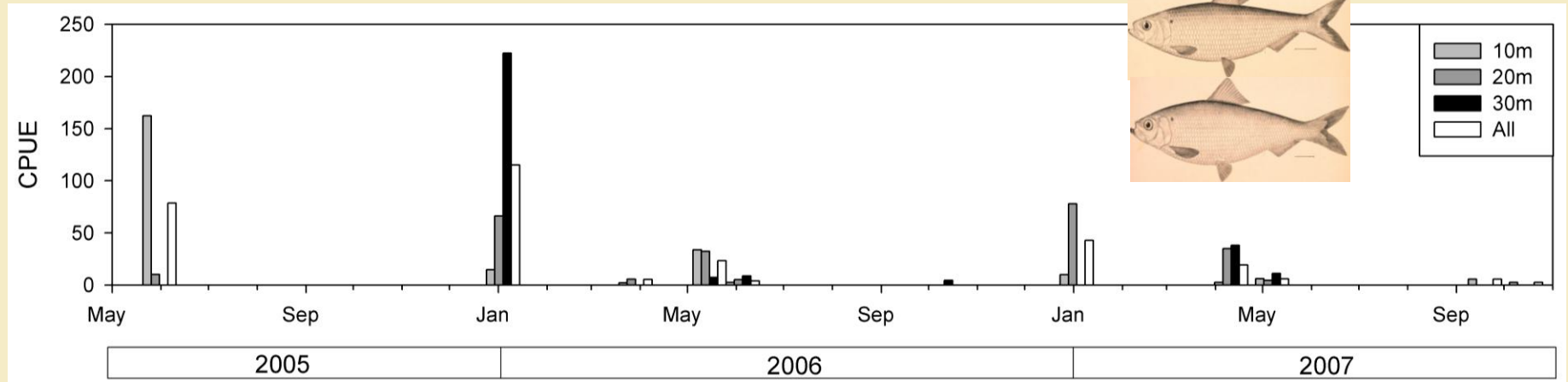
Assistant Professor (fall 2012)
Department of Environmental Conservation
University of Massachusetts - Amherst
Amherst, MA

River herring distributions

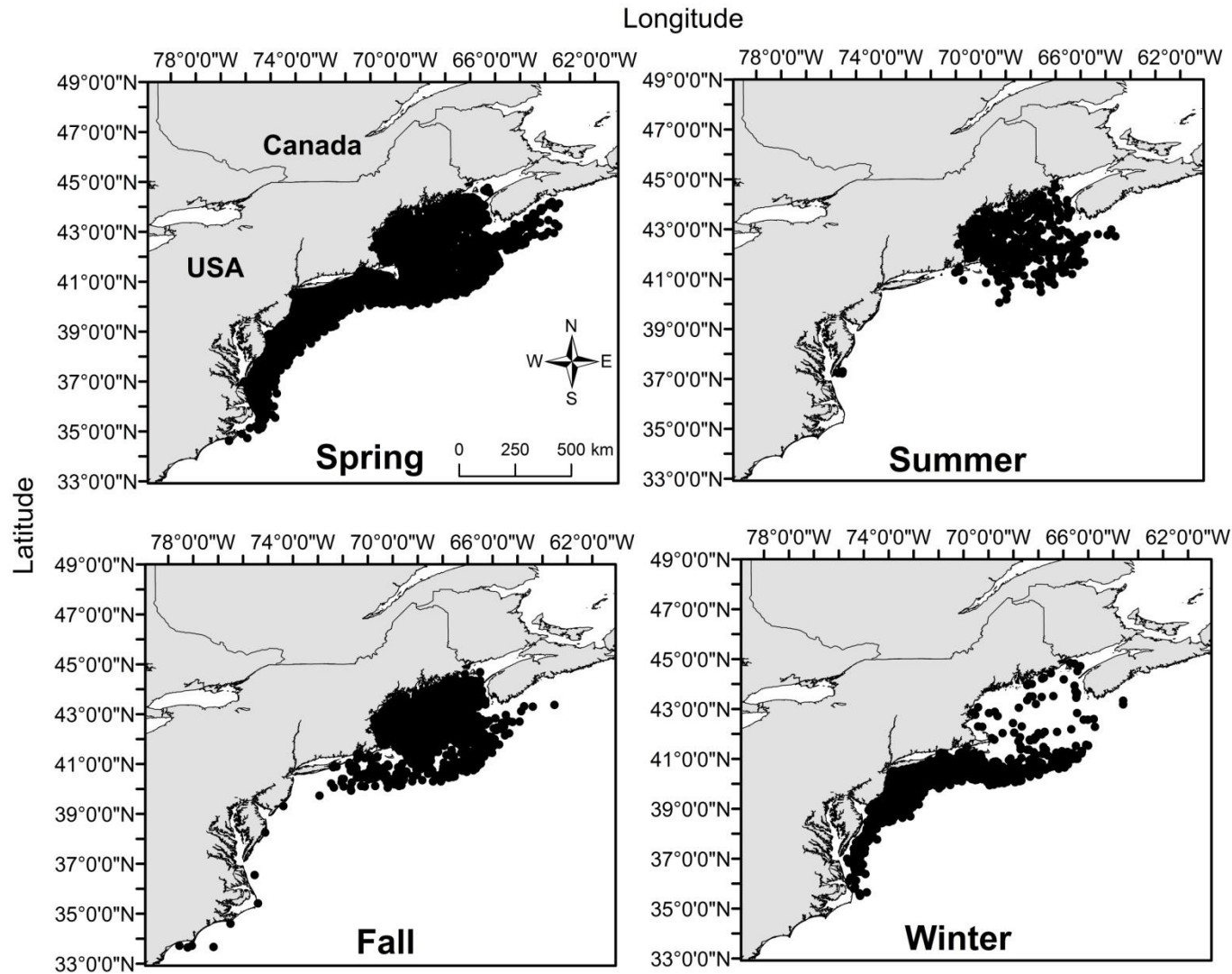


Data from National Marine Fisheries Service trawl survey

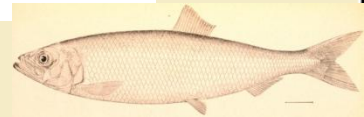
Jordaan et al. In Prep – SNE seasonal effect



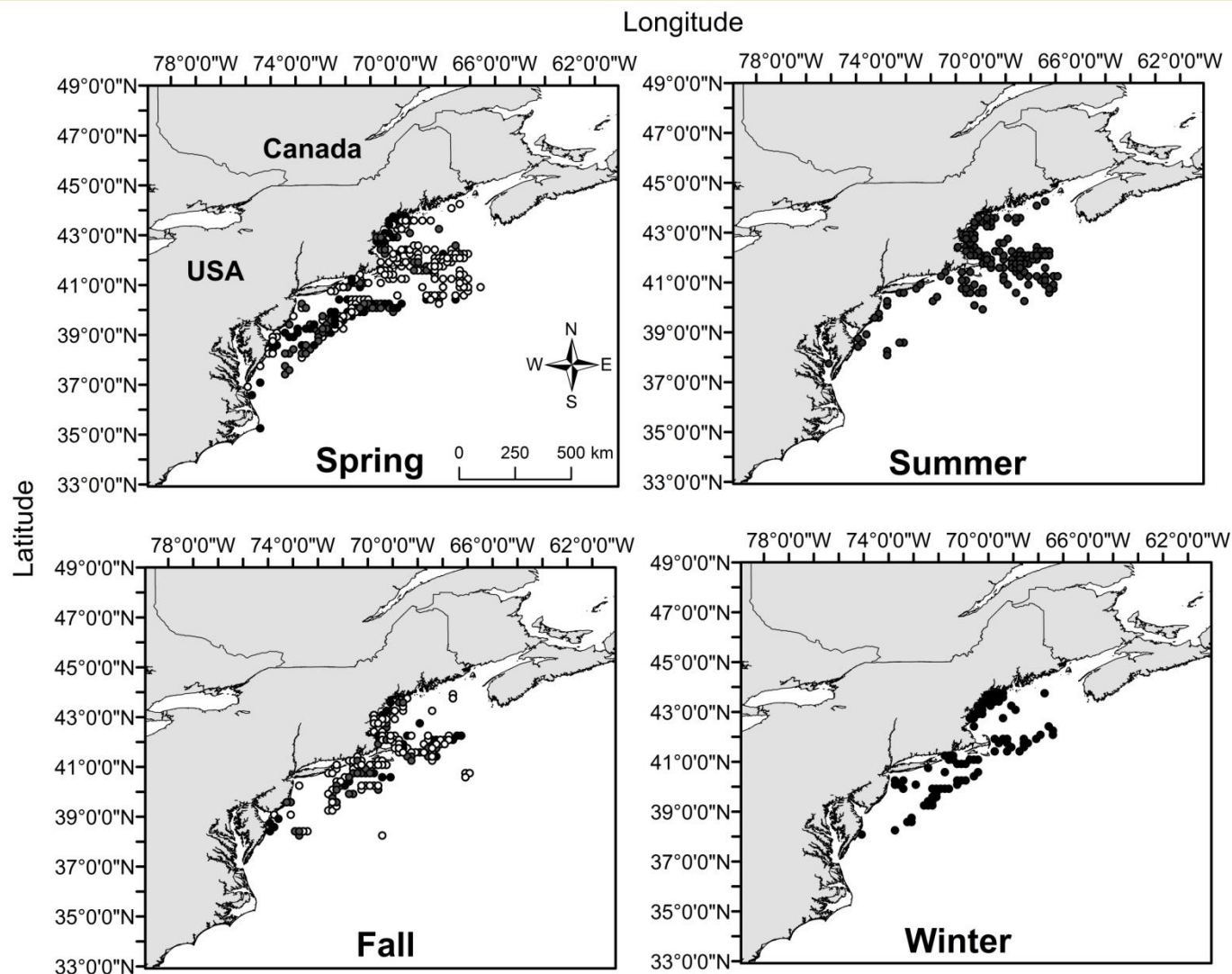
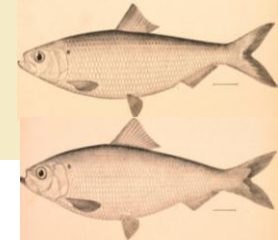
Atlantic herring distributions



Data from National Marine Fisheries Service trawl survey

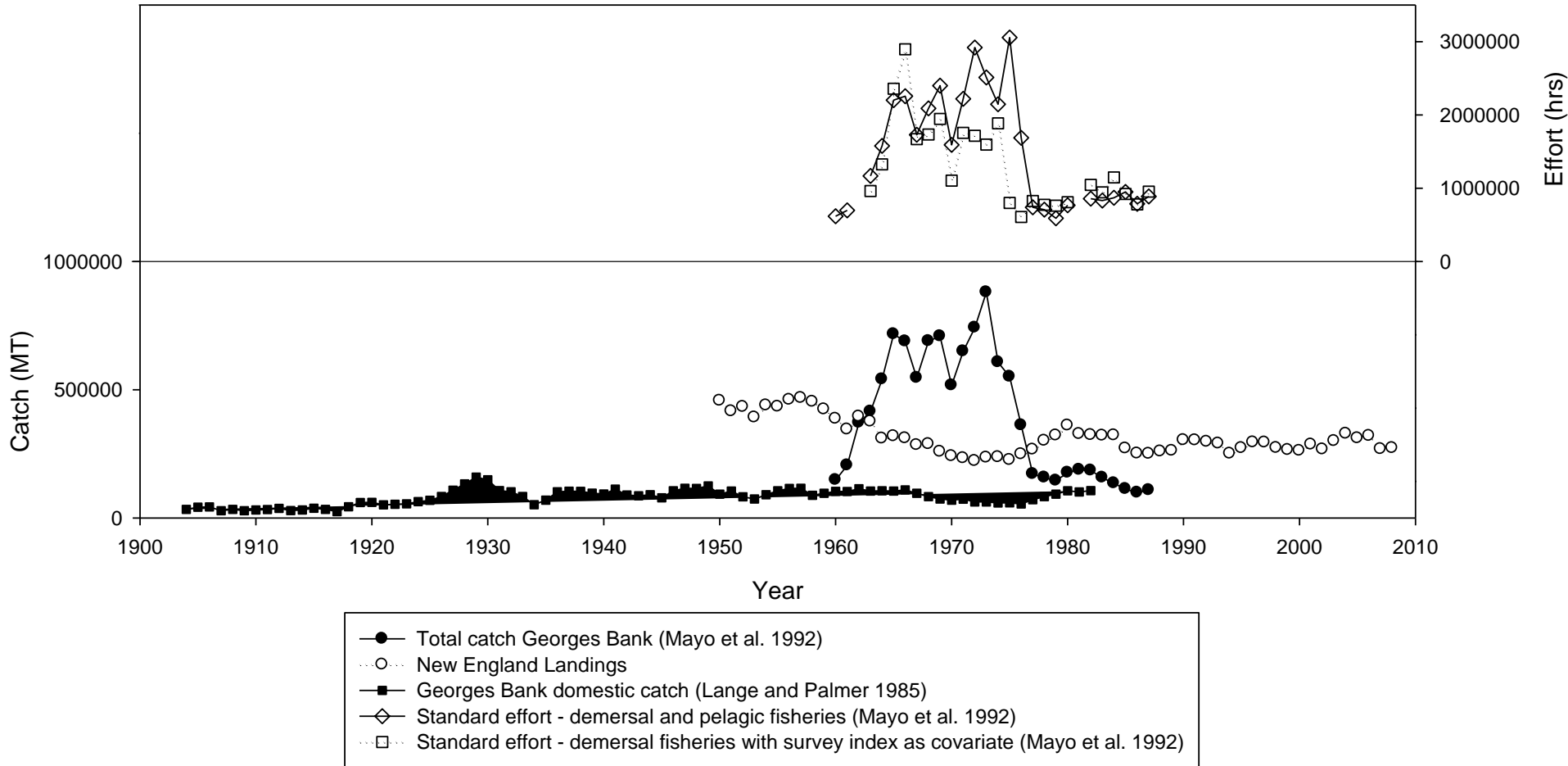


River herring bycatch

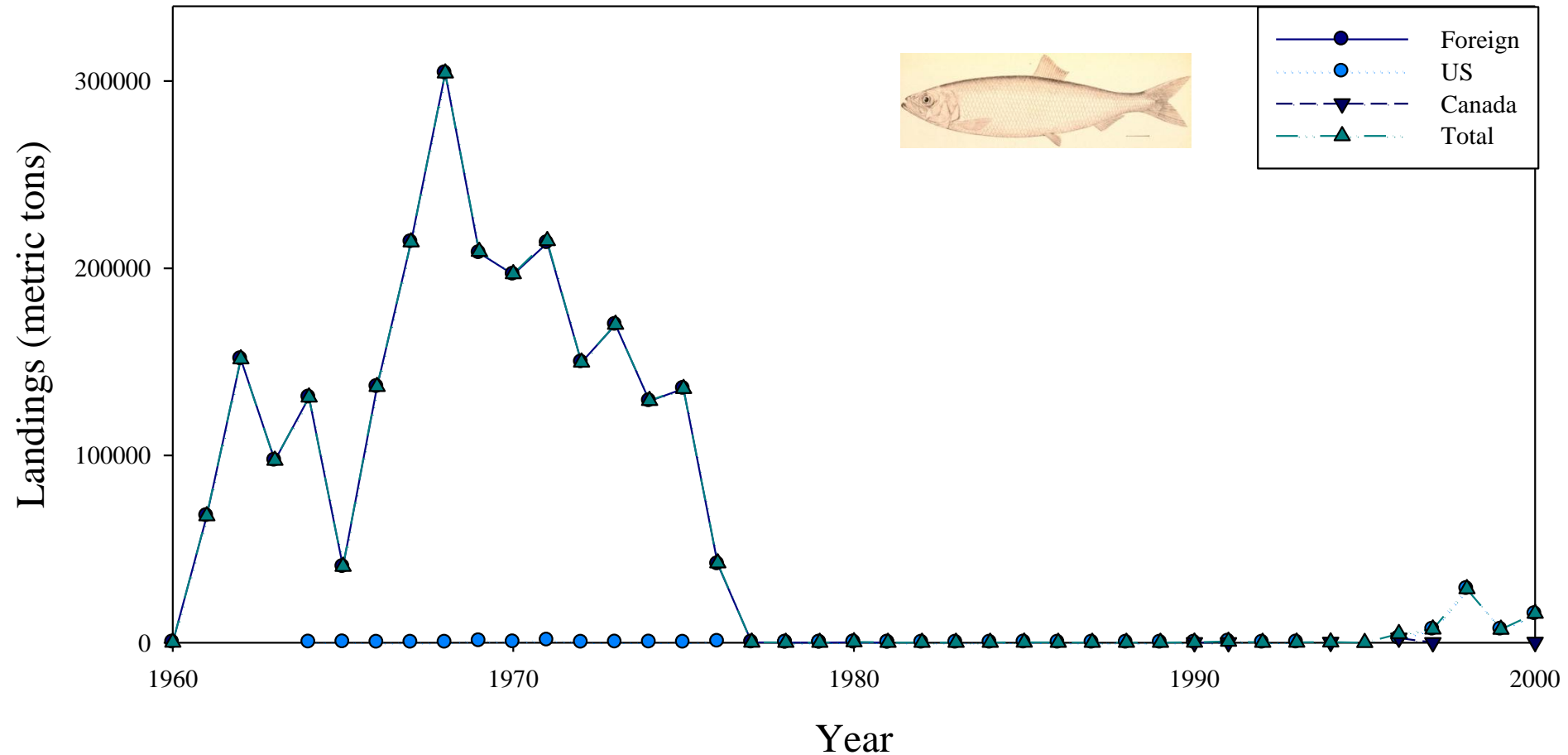


Data from Northeast Observer Program

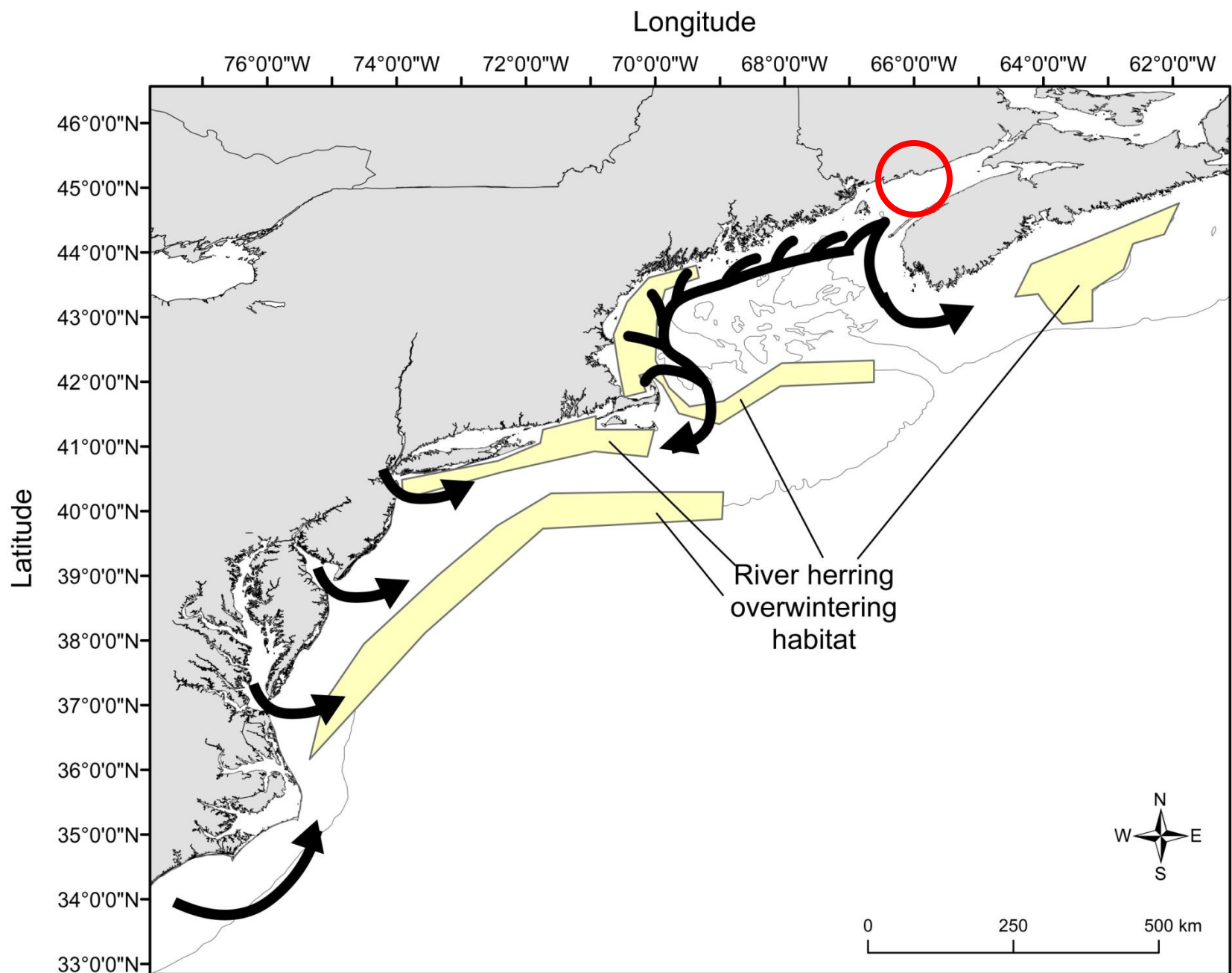
Fisheries landings and effort



Georges Bank Atlantic Herring



| River | HerringGB | HerringGOM | HerringSNE | MackLand | StBass | NAO |
|-------------------------|-----------|------------|------------|-----------|-----------|----------|
| Union River | | | | | | |
| Androscoggin River | | | | (+) 0.001 | | |
| Saco River | | | | | | |
| Saint Croix River | | | | (+) 0.01 | | |
| Damariscotta River | | | | (+) 0.05 | | |
| Exeter River | | (+) 0.05 | | | | |
| Lamprey River | | (-) 0.001 | | | (+) 0.01 | |
| Taylor River | (-) 0.05 | (-) 0.001 | | (-) 0.01 | (-) NS | |
| Cochecho River | | | | | (+) 0.01 | |
| Winnicut River | | | | (+) 0.01 | | |
| Oyster River | | (+) 0.05 | | | | |
| Monument River Alewife | | (+) 0.001 | | | | |
| Monument River Blueback | | | | | | |
| Mattapoissett River | | (-) 0.05 | | (-) 0.001 | | |
| Parker River | | | | | (-) 0.01 | (+) 0.05 |
| Merrimack River | | (+) 0.05 | | (+) 0.01 | (-) 0.01 | |
| Gilbert-Stuart River | | (-) 0.05 | (+) 0.001 | | | |
| Nonquit River | | | | | (-) 0.001 | |
| Buckeye River | | | | | | |
| Connecticut River | | (-) 0.01 | | | (-) 0.001 | |
| Chowan River Alewife | | (-) 0.01 | | | (-) 0.05 | |
| Chowan River Blueback | | (-) 0.05 | | | (-) 0.05 | |



Stone, H.H. and B.M. Jessop 1992 Fisheries Bulletin 90: 376-389 (Canadian overwintering area)

Mixing in ocean

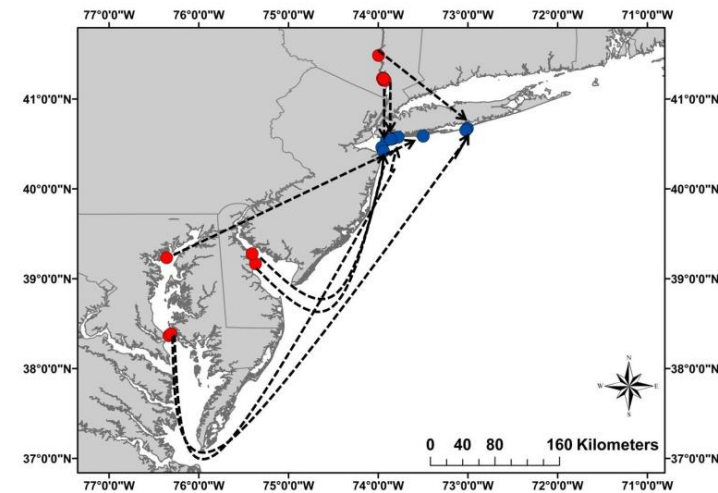
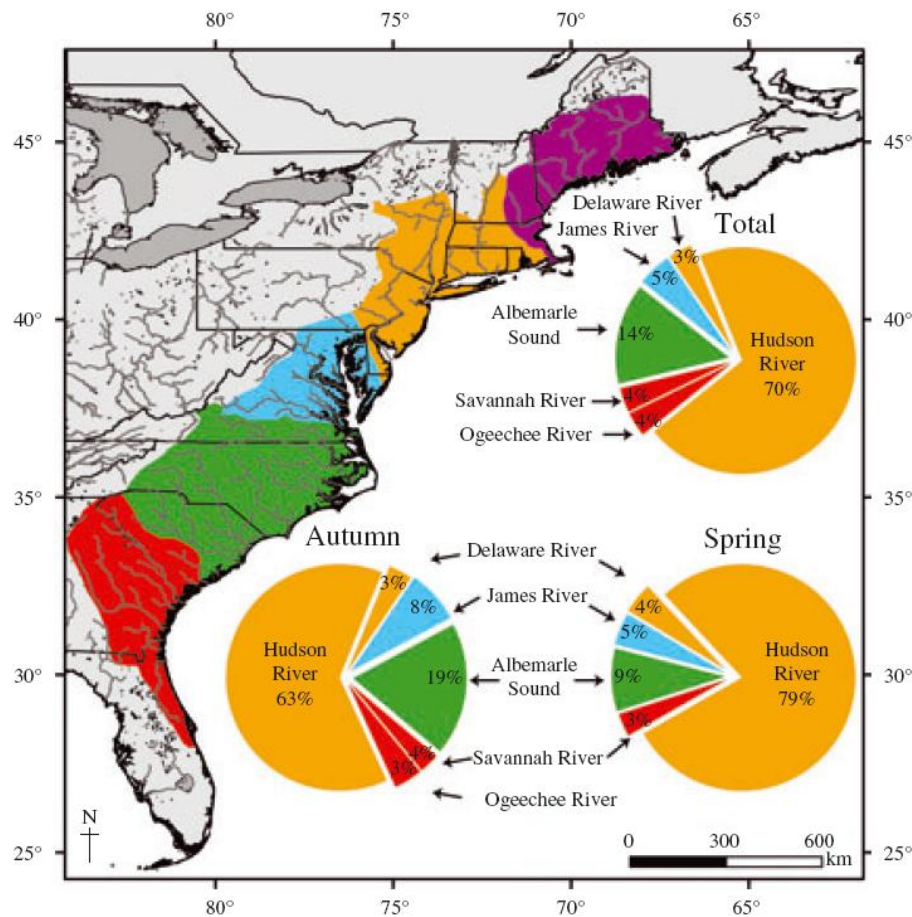


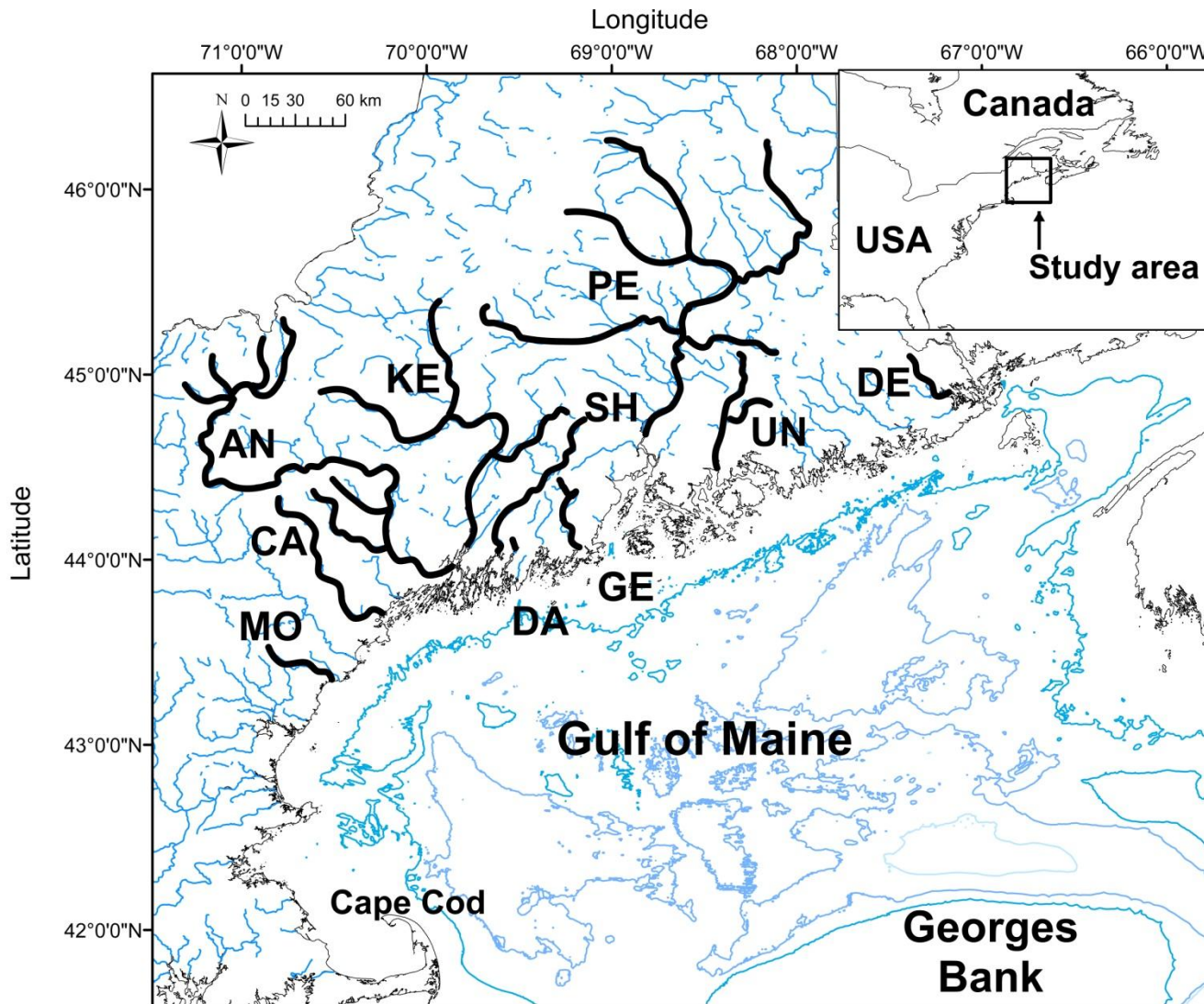
FIG. 1. Map of the U.S.A. showing the location of the five *Acipenser oxyrinchus oxyrinchus* distinct population segment (DPS) units: Gulf of Maine (■), New York Bight (■), Chesapeake Bay (■), Carolina (■) and the South Atlantic (■) as defined from the Atlantic Sturgeon Status Review Team (2007). Pie charts show the contribution of each river and DPS unit (colours of DPS units identified above) to the individuals sampled in this study from the New York Bight for spring ($n = 181$), autumn ($n = 150$) and overall ($n = 364$).

Dunton, K.J., D. Chapman, A. Jordaan, K. Feldheim, S. O'Leary, K.A. McKown and M.G. Frisk. 2012 Genetic mixed-stock analysis of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* in a heavily exploited marine habitat indicates the need for routine genetic monitoring.

Legacy of waterway obstruction

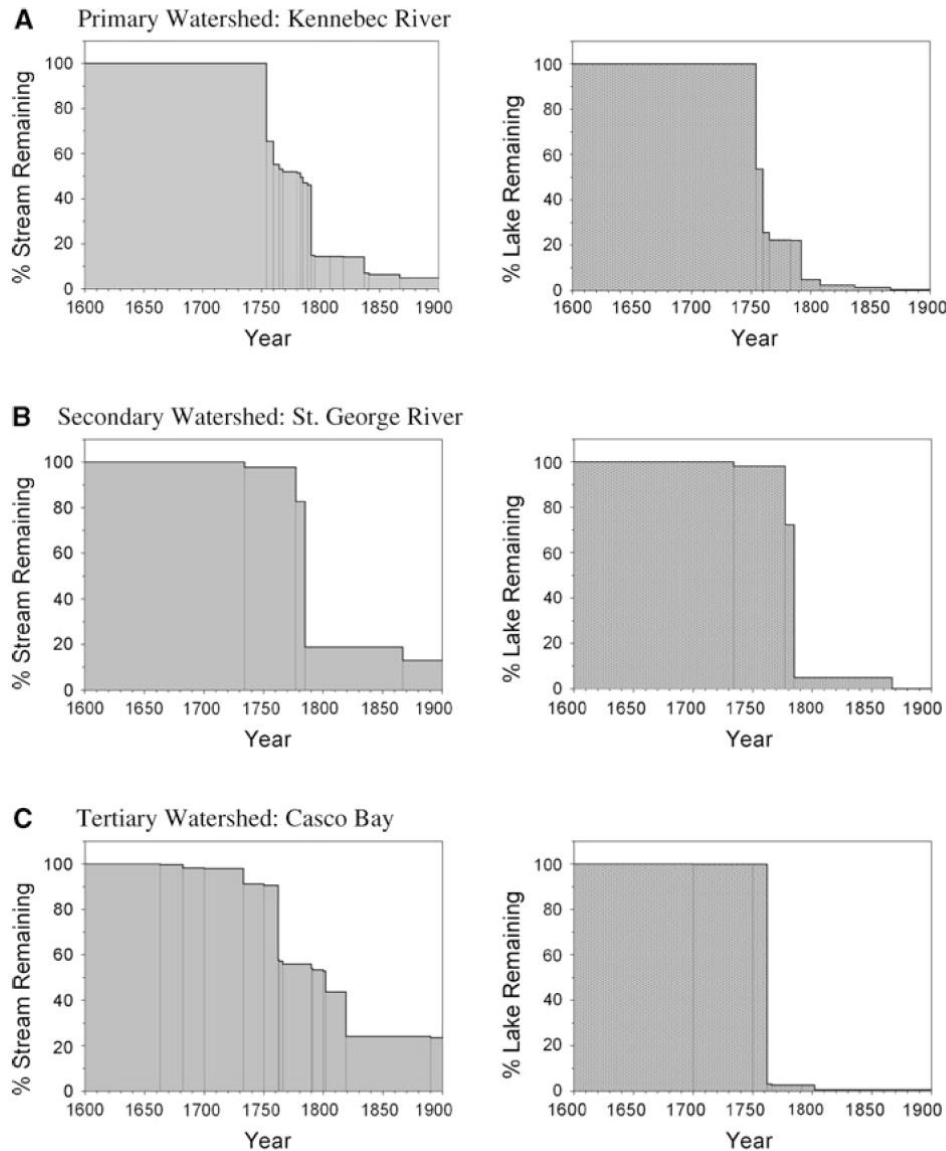


Lost production



Timeline of obstruction and habitat loss

Fig. 3 Percent virgin habitat. Percent stream distance remaining (*on left*) and percent lake surface area remaining (*on right*) for representative watersheds of three categories and all nine assessed watersheds combined to represent the state: **a** primary rivers represented by the Kennebec River, **b** secondary rivers represented by the St. George River, **c** tertiary bay systems represented by Casco Bay and **d** state of Maine. Vertical drop down lines in each graph indicate year of dam construction that resulted in a measurable loss of potential spawning habitat

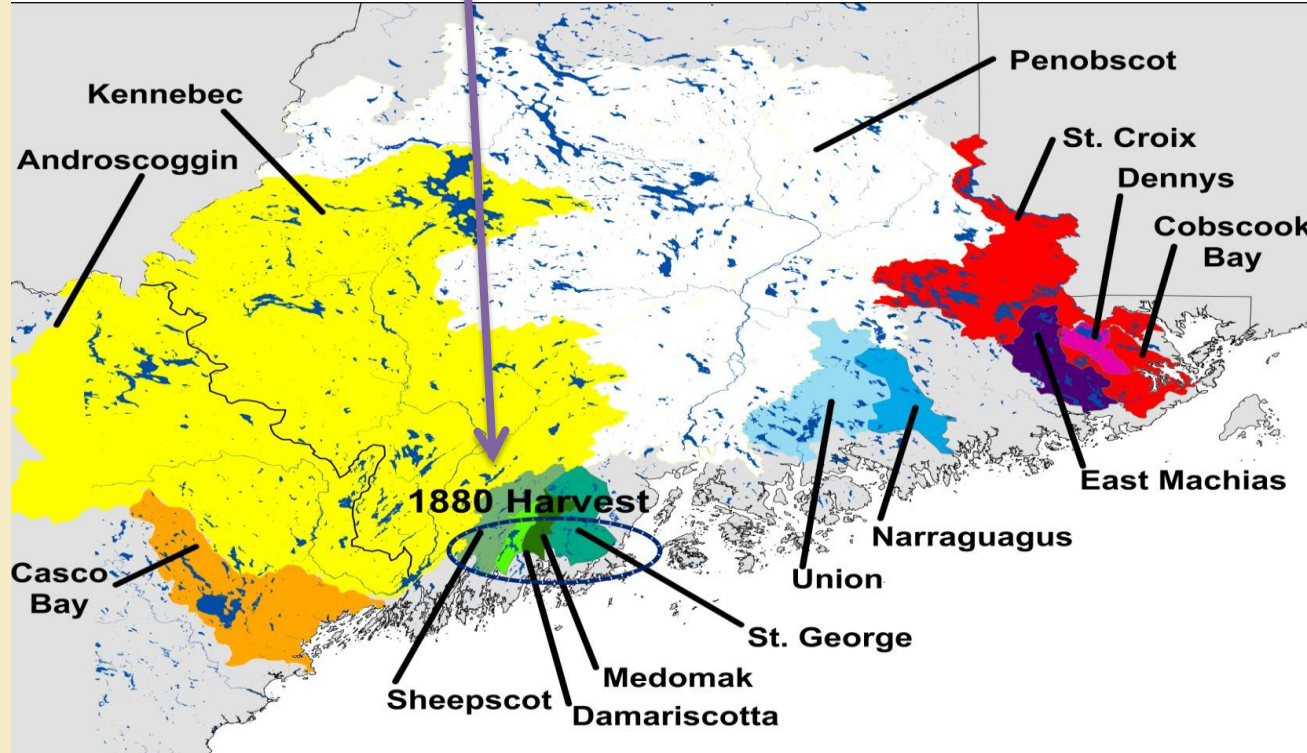
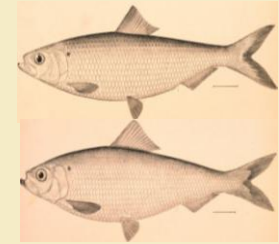
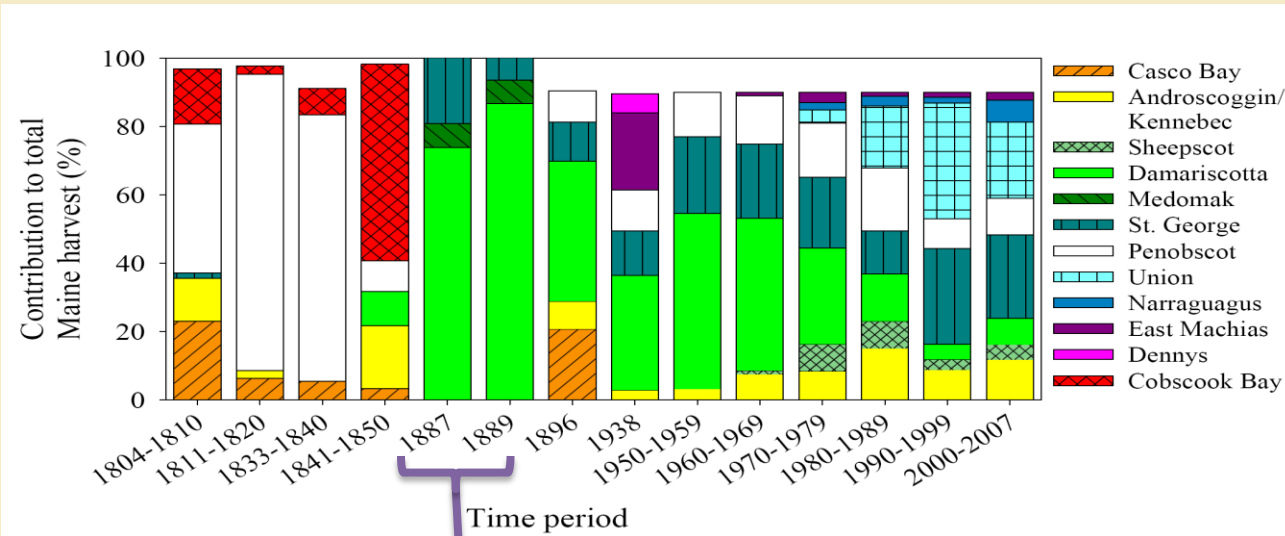


Declines start in 1700s, accelerate from 1750 to 1800

By 1850:
< 5% virgin lake area remaining in all watersheds

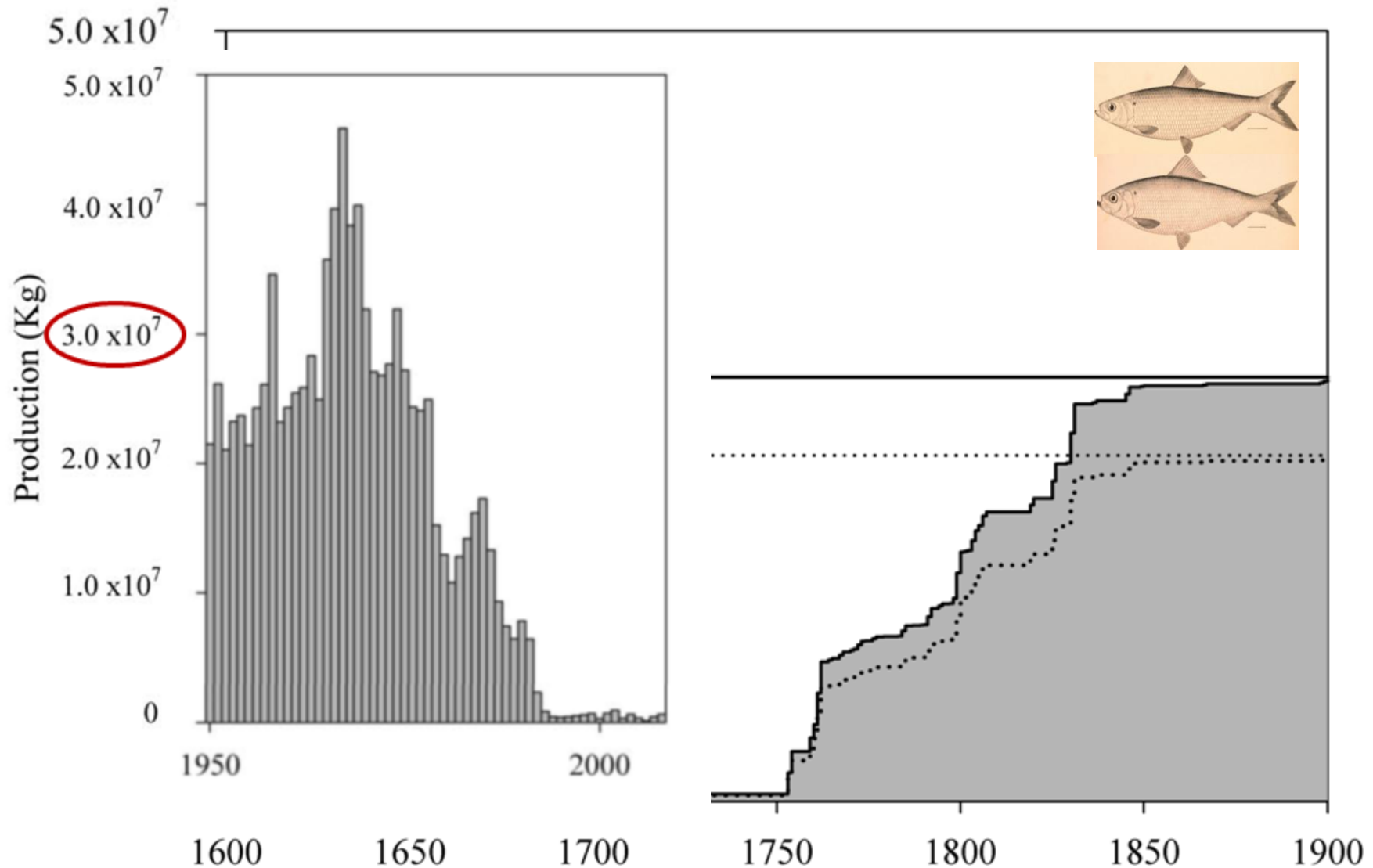


Shifting fisheries production



From Hall et al. In Press

Lost production





Key considerations (for me)

- Straying rate
 - Did it maintain genetic variation during 1800s population loss?
 - How far do river herring stray to populate new/restored habitat?
 - Should this be considered in “stock structure”
- Population size
 - Was there adequate population size to avoid random genetic drift (faux structure)